S/N 10/533,745 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	PATRICK	Serial No.:	10/533,745
Filed:	May 4, 2005	Docket No.:	20007.0001USWO
Title:	A COMPOSITE BEAM		

CERTIFICATE UNDER 37 CFR 1.8:
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on November 1, 2005.

By: _____
Name: Antonette Peters

SUBMISSION OF PRIORITY DOCUMENT(S)

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Commissioner:

Applicants enclose herewith one certified copy of a Australian application, Serial No. 2002952445, filed November 4, 2002, the right of priority of which is claimed under 35 U.S.C. § 119.

Respectfully submitted,

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Dated: November 1, 2005

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Australian Government

Patent Office
Canberra

I, JANENE PEISKER, TEAM LEADER, EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002952445 for a patent by ONESTEEL REINFORCING PTY LTD AND UNIVERSITY OF WESTERN SYDNEY as filed on 04 November 2002.

WITNESS my hand this
Ninth day of August 2005

JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

ONESTEEL REINFORCING PTY LTD

UNIVERSITY OF WESTERN SYDNEY

Invention Title:

A COMPOSITE BEAM

The invention is described in the following statement:

A COMPOSITE BEAM

The present invention relates to internal composite beams for the construction industry.

The term "composite beam" is understood herein to mean: (i) a beam, preferably formed from steel, and (ii) a solid slab or a composite slab; that are interconnected by shear connection to act together to resist action effects as a single structural member.

The term "shear connection" is understood herein to mean an interconnection between a beam and a solid slab or a composite slab of a composite beam which enables the two components to act together as a single structural member under the action effect of bending which causes longitudinal shear forces to develop.

In conventional composite beams, typically, the shear connection includes shear connectors, slab concrete, and transverse reinforcement.

The term "shear connector" is understood herein to mean a mechanical device attached to a beam (typically to a top flange of the beam) which forms part of the shear connection.

The present invention relates particularly, although by no means exclusively, to internal composite beams of the type which include:

(a) an internal horizontal beam (typically steel) supported at each end;

(b) a composite slab that is positioned on and supported by the beam and includes:

(i) profiled metal (typically steel) sheeting having a plurality of pans separated by ribs;

(ii) concrete cast on the sheeting, with the cast concrete including concrete ribs defined by the pans and sides of adjacent ribs; and

(iii) reinforcement embedded in the cast concrete; and

(c) a plurality of shear connectors, typically in the form of headed studs, embedded in the cast concrete and welded to the beam thereby to connect the composite slab to the beam.

The present invention is concerned with overcoming a major problem identified by the applicant that occurs with internal composite beams of the type described above that include conventional welded stud shear connectors and profiled steel decking having open metal ribs. The problem is a complex type of rib pull-off failure that has been observed by the applicant in research work that has been carried out by the applicant on internal composite beams. The applicant has previously carried out research work in relation to edge composite beams and found that there is a particular profile of the failure surface for the beams. The applicant anticipated that there would be a similar profile for the failure surface of internal composite beams. However, subsequent research work carried out by the applicant has indicated that the actual profile of the failure surface of internal composite beams is quite different to that of edge composite beams and that the

reinforcement requirements are different. Specifically, the applicant has found that the profile of the failure surface of internal composite beams is characterised by tapered or conical surfaces that extend over the shear connectors and down to the pans of the profiled metal sheeting. This failure surface is hereinafter referred to as "the conical-type failure surface".

With the above in mind, according to the present invention there is provided an internal composite beam which includes:

(a) a beam;

(b) a solid slab or a composite slab positioned on and supported by the beam, the solid slab and the composite slab including a plurality of concrete ribs;

(c) a plurality of shear connectors positioned in at least one of the concrete ribs and connecting the solid slab or the composite slab to the beam; and

(d) a reinforcing component embedded in at least one concrete rib that includes embedded shear connectors, the reinforcing component being in the form of a mesh that includes line wires and cross wires that are connected together at the intersections of the wires, and the reinforcing component being embedded so that there are line wires and/or cross wires that intersect the above-described conical-type failure surface around shear connectors.

The applicant has found that the reinforcing

component described in sub-paragraph (d) above improves dramatically the resistance to pull-off failure of the internal composite beam.

Preferably the reinforcing component is embedded so that there are line wires and cross wires that intersect the above-described conical-type failure surface around shear connectors.

The applicant has found that in many situations the cross wires are very important in terms of reinforcing the composite beam at the failure surface.

The concrete ribs may extend parallel or transverse to the beam.

It is preferred that the mesh be positioned so that the line wires extend in the longitudinal direction of the concrete ribs.

In a situation in which the composite beam includes a composite slab rather than a solid slab, preferably the composite slab includes profiled metal sheeting having a plurality of metal pans separated by metal ribs and concrete cast on the profiled sheeting.

Preferably the mesh is positioned in the concrete rib below the level of the tops of adjacent ribs of the profiled sheeting.

It is preferred that the mesh be positioned in the concrete rib between 25% and 75% of the height of the adjacent metal ribs.

It is preferred that the mesh extend across the width of the concrete rib at the position of the mesh in the concrete rib.

It is preferred that the beam be a steel beam.

It is preferred that the profiled metal sheeting be profiled steel sheeting.

It is preferred that the beam be supported at each end.

The beam may be supported also at one or more locations along the length of the beam.

It is preferred that the shear connectors be headed studs.

The shear connectors may be of any other suitable form such as a structural bolts or channels or shot-fired connectors.

It is preferred that there be a minimum spacing between the shear connectors along the length of the beam of at least 5 times the diameter of the shear connectors.

It is preferred that the spacing between the shear connectors along the length of the beam be no more than 7.5 times the height of the shear connectors above the top of the concrete ribs. This maximum spacing avoids having to use a reinforcing component of the type described in Australian patent application 69998/01 in the name of the applicant in the composite beam.

In a situation in which the composite beam includes a composite slab rather than a solid slab and the composite slab includes profiled metal sheeting, the top of the concrete ribs is taken to be the top of the adjacent metal ribs.

In one arrangement it is preferred that the reinforcing component be a flat sheet of welded wire mesh that includes a rectangular array of parallel line wires and cross wires welded together at the intersections of the wires.

The present invention is not limited to the arrangement described in the preceding paragraph and extends, by way of example, to mesh formed from line wires and cross wires that are welded together at wire intersections and has line wires that have a zig-zag or "waveform" shape along at least part of the length of the line wires.